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(54) Abstract Title
One use syringe

(57) A retractable and destructible safety syringe including a syringe barrel 21, a plunger 36, a needle holder 32, a needle 24, clicks 25 formed on the needle holder or the plunger and a one-way movable detent 26 formed on the plunger or the needle holder. When a piston of the plunger is pushed to the bottom, the detent engages with the clicks, whereby the needle holder and the needle are pulled back into the barrel. In addition, the tip of the needle is pressed against a shoulder section of the barrel and bent. Sealing fixing rings are formed on the outer wall of the needle holder and inner wall of the needle holder cavity. An ensurance latch plate may be disposed between the barrel and the plunger to prevent the plunger from being pushed to latch the clicks with the detent by mistake.

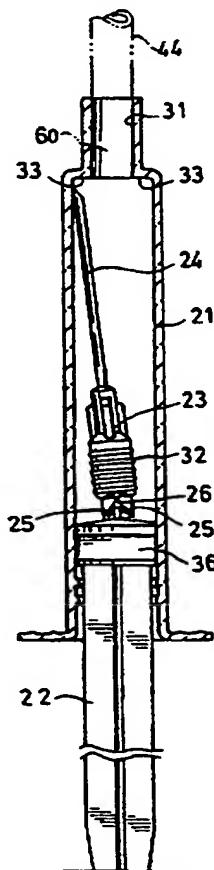


FIG.8

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A RETRACTABLE AND DESTRUCTIBLE SAFETY SYRINGE

The present invention relates to a retractable and destructible safety syringe which has simple structure and can be easily manufactured at low cost and commercialized.

Various types of disposable syringes are widely used nowadays. After discarded, large amount of such syringes result in problem of pollution of environment. The used syringes often impale medical personnel and infect the personnel with viruses or bacteria carried by the patients. Especially, in case the medical personnel are infected with AIDS virus, the personnel may die innocently.

In order to solve these problems, various types of retractable syringes have been developed. For example, a spring is installed between the syringe barrel and the piston for pulling the needle back into the barrel after injection. However, due to the property of the liquid medicine, the material of the spring is strictly limited. Therefore, the structure of such syringe is complicated and the manufacturing cost is very high. Various types of safety syringes free from the springs have been also developed. In such syringe, a latch member is disposed at the bottom of the barrel, whereby when the plunger is pushed to the bottom of the barrel, the latch

member latches the plunger with the needle. Therefore, when the plunger is pulled back, the needle is retracted into the barrel along with the plunger so as to avoid impalement of the medical personnel.

In order to avoid leakage of the liquid medicine and unexpected dropping of the needle from the barrel, the needle must be firmly assembled with the barrel. However, in the case that the needle is excessively firmly assembled with the barrel, it will be difficult to pull the needle back into the barrel. Therefore, it is troublesome to consider both situations.

In addition, in the case that it is necessary to securely latch the plunger with the needle, it will be relatively difficult to engage the plunger with the needle. Reversely, if it is easy to latch the plunger with the needle, the plunger will be inevitably unreliably engaged with the needle and such engagement will be insufficient for pulling the needle back into the barrel. Also, it is troublesome to consider both situations.

Moreover, it often takes place that before the injection is completed, the plunger is latched with the needle by mistake. This will lead to waste of the needle.

It is therefore a primary object of the present invention to provide a retractable and destructible safety syringe which can avoid leakage of liquid medicine and prevent the needle from accidentally dropping out of the barrel. Also, the needle can be easily pulled back into the barrel.

It is a further object of the present invention to provide the above safety syringe in which the plunger can be easily firmly latched with the needle and the needle can be also reliably pulled back into the barrel.

It is still a further object of the present invention to provide the above safety syringe in which before the injection is completed, the needle is prevented from being latched by mistake.

According to the above objects, the retractable and destructible safety syringe of the present invention includes: a syringe barrel having a first and a second ends and formed with an internal chamber, the first end being disposed with a needle socket defining a needle holder cavity, an annular shoulder section being formed between the internal chamber and the cavity; a plunger having a first and a second ends, the first end being disposed with a piston and fitted into the barrel, the plunger having a first axis; a needle holder having a first and a second ends, an outer periphery of the second end being fitted in the internal chamber of the first end of the

barrel, the needle holder having a second axis; a needle inserted into the first end of the needle holder; and a needle retracting means including; at least a click having a first and a second ends, the first end being rotatably and resiliently disposed on one of the first end of the plunger and the first end of the needle holder, a distance between the first end of the click and any of the first and second axes being defined as a first distance, the second end of the click extending toward the other of the first end of the plunger and the first end of the needle holder, in a free state, a distance between the second end of the click and any of the first and second axes being defined as a second distance, the second distance being less than the first distance; and a detent having a first and a second ends, the first end being disposed on the other of the first end of the plunger and the first end of the needle holder, the first end extending along the axes toward one of the first end of the plunger and the first end of the needle holder, the second end of the detent being disposed with a hook section having a radially extending hook surface, whereby when the first end of the plunger is pushed to the first end of the barrel, the hook section of the detent slides over the second end of the click, then the click resiliently clamp the hook of the detent and when the plunger is pulled from the first end of the barrel to the second end thereof, the hook surface of the hook section abuts against the second end of the click to force the second end toward the center of the detent so as to firmly engage with the hook surface of the hook section and

pull the needle holder and the needle back into the barrel. So much the better, there are two or more clicks radially arranged about the axes.

One of the inner wall of the needle holder cavity and the outer wall of the needle holder further includes a sealing fixing ring. There are at least two sealing fixing rings are provided.

Both of the inner wall of the needle holder cavity and the outer wall of the needle holder further include sealing fixing rings fitted with each other.

The safety syringe further includes: an ensurance latch plate having a first and a second ends, the first end being connected with the second end of the barrel; a first latch section disposed at the second end of the ensurance latch plate; and a second latch section disposed at the second end of the plunger, the second latch section being latched with the first latch section so as to locate the detent near the click and prevent the detent from engaging with the click by mistake.

The present invention can be best understood through the following description and accompanying drawings, wherein:

Fig. 1 is a perspective exploded view of a first embodiment of the present invention;

Fig. 2 is a perspective assembled view of the first embodiment of Fig. 1;

Fig. 3 is a perspective bottom view showing the needle and the needle holder of the first embodiment;

Fig. 4 is a sectional view showing that the liquid medicine is sucked into the syringe barrel of the first embodiment;

Fig. 5 is a sectional view showing that the liquid medicine is completely injected and the detent disposed on the piston is latched with the click disposed on the needle holder;

Fig. 6 is a front view showing that the liquid medicine is about to be completely injected and the detent is passing through the click;

Fig. 7 is a front view showing that the detent has passed through the click and is gripped thereby;

Fig. 8 is a sectional view showing that the injection is completed and the needle is pulled back into the barrel and automatically tilts laterally;

Fig. 9 is an enlarged view of area 9 denoted by phantom line of Fig. 7, in which the plunger is pulled downward and two clicks simultaneously clip the plunger;

Fig. 10 is a sectional view showing that after the needle is pulled back into the barrel, the plunger is again pushed forward to bend and damage the needle;

Fig. 11 is a sectional view of a second embodiment of the

present invention, in which the liquid medicine is sucked into the barrel;

Fig. 12 is a front view of the needle and the needle holder of the second embodiment;

Fig. 13 is an enlarged bottom view of the needle and the needle holder of the second embodiment;

Fig. 14 is a sectional view according to Fig. 12, showing that the liquid medicine is completely injected and the click disposed on the plunger is latched with the detent disposed on the needle holder;

Fig. 15 is a front view of the needle and the needle holder of a third embodiment of the present invention;

Fig. 16 is an enlarged bottom view of the needle and the needle holder of the third embodiment; and

Fig. 17 is a sectional view according to Fig. 15, showing that the liquid medicine is completely injected and the click disposed on the plunger is latched with the detent disposed on the needle holder.

Please refer to Figs. 1 to 4. The safety syringe 20 of the present invention includes a syringe barrel 21, a plunger 22, a needle holder 23 and a needle 24. The syringe barrel 21 has a first and a second ends 28, 29 and is formed with an internal chamber 27. The first end 28 is disposed with a needle socket 30 defining a needle holder cavity 31. An annular shoulder

section 33 is formed between the internal chamber 27 and the cavity 31. The plunger 22 has a first and a second ends 34, 35. The first end 34 is disposed with a piston 36 and fitted into the barrel 21. The plunger 22 has a first axis 47. The needle holder 23 has a first and a second ends 37, 38. The outer periphery of the second end 38 is fitted in the internal chamber 27 of the first end 28 of the barrel 21. The needle holder 23 has a second axis 48. The needle 24 is inserted into the first end 37 of the needle holder 23.

Referring to Figs. 3 to 9, the needle retracting means includes two clicks 25 & 25' and a detent 26. The clicks 25 & 25' has a first and a second ends 49, 50. The first end 49 is rotatably and resiliently disposed on one of the first end 34 of the plunger 22 and the first end 37 of the needle holder 23. The distance between the first end 49 of the click 25 or 25' and any of the first and second axes 47, 48 is defined as a first distance 51. The second end 50 of the click 25 or 25' extends toward the other of the first end 34 of the plunger 22 and the first end 37 of the needle holder 23. In a free state, the distance between the second end 50 of the click 25 and any of the first and second axes 47, 48 is defined as a second distance 52. The second distance 52 is less than the first distance 51.

Referring to Figs. 3 to 14, the detent 26 has a first and a second ends 53, 54. The first end 53 is disposed on the other

of the first end 34 of the plunger 22 and the first end 37 of the needle holder 23. The first end 53 extends along the axes 47, 48 toward one of the first end 34 of the plunger 22 and the first end 37 of the needle holder 23. The second end 54 of the detent 26 is disposed with a hook section 55 having a radially extending hook surface 56. A stem 58 extends between the hook section 55 and the first end 53 of the detent.

When the first end 34 of the plunger 22 is pushed to the first end 28 of the barrel 21, the hook section 55 of the detent 26 slides over the second end 50 of the clicks 25 & 25' and these clicks 25 & 25' resiliently clamp the stem 58. When the plunger 22 is pulled from the first end 28 of the barrel 21 to the second end 29 thereof, the hook surface 56 of the hook section 55 abuts against the second end 50 of the clicks 25 & 25' to force the second end 50 toward the center of the detent 26 in a direction shown by the arrows 57 & 57' respectively (As shown in Fig. 9), so as to firmly engage with the hook surface 56 of the hook section 55, whereby the needle holder 23 and the needle 24 can be together pulled into the barrel 21.

Referring to Figs. 3 to 9, as necessary, the syringe of the present invention can be disposed with at least two clicks 25 radially arranged about the axes.

Referring to Figs. 1 to 9, one of the inner wall of the needle holder cavity 31 of the barrel 21 and the outer wall of

the needle holder 23 further includes one or more sealing fixing rings 32 as necessary.

Referring to Figs. 15 to 17, as necessary, both of the inner wall of the needle holder cavity 31 of the barrel 21 and the outer wall of the needle holder 23 can be disposed with one or more sealing fixing rings 32, 39 fitted with each other.

Referring to Figs. 1 and 2, the safety syringe 20 of the present invention further includes an ensurance latch plate 41, a first latch section 42 and a second latch section 43. The ensurance latch plate 41 has a first and a second ends 45, 46. The first end 45 is connected with the second end 29 of the barrel 21. The first latch section 42 is disposed at the second end 46 of the ensurance latch plate 41. The second latch section 43 is disposed at the second end 35 of the plunger 22. The second latch section 43 can be latched with the first latch section 42 so as to locate the detent 26 near the click 25 and prevent the detent 26 from engaging with the click 25 by mistake.

As shown in Figs. 1 to 4, prior to use, the needle 24 is installed in the needle holder cavity 31 of the insertion socket 30. The sealing fixing ring 39 of the needle holder 23 is tightly and firmly engaged with the sealing fixing ring 32 of the inner wall of the cavity 31. A needle sheath 44 is fitted around the needle 24. The plunger 22 and the piston 36

are fitted into the internal chamber 27 of the barrel 21. The first latch section 42 of the ensurance latch plate 41 is latched with the second latch section 43 of the second end 35 of the plunger 22. The detent 26 is close to but separated from the clicks 25 & 25'.

The clicks 25 & 25' is loosely engaged with the detent 26 so that after the tip 40 of the needle 24 is pulled back into the barrel 21, the tip 40 will laterally tilt due to unstability. At this time, the tip 40 is positioned under the shoulder section 33 of the barrel 21. The shoulder section 33 serves to stop the tip 40 and forcedly bend the needle 24.

When injecting, an operator thrusts the needle 24 into a liquid medicine bottle. Then the ensurance latch plate 41 is unlatched, permitting the plunger 22 to be pulled outward for sucking the liquid medicine into the barrel 21 (as shown in Fig. 4). Then the needle 24 is directed upward and the plunger 22 is slightly pushed upward to exhaust the air on upper portion of the barrel 21 from the tip 40 of the needle 24. After the injection is completed, as shown in Figs. 5 and 9, the plunger 22 is pushed to the bottom. At this time, the detent 26 can easily push the clicks 25 & 25' away and automatically engage with the clicks 25 & 25' of the second end 38 of the needle holder 23. The clicks 25 & 25' resiliently clamp the stem 58 of the detent 26. Then, as shown in Fig. 8, when the plunger 22 is pulled back, two opposite

clicks 25 & 25' are depressed by the hook surface 56 of the detent 26 and are respectively rotated about the bending sections 59 & 59' in the directions shown by the arrows 58 & 58'. At this time, the opposite clicks 25 & 25' simultaneously firmly clamp the stem 58 of the detent 26. The greater the downward pulling force of the plunger 22 is, the greater the clamping force is. Therefore, the clicks 25 & 25' can very firmly clamp the hook surface 56 of the detent 26 without loosening (as shown in Fig. 9).

As shown in Fig. 8, after the needle 24 is totally pulled back into the barrel 21, the clicks 25 & 25' are loosely engaged with the detent 26 so that the tip 40 of the needle 24 will laterally tilt due to instability. At this time, the tip 40 is positioned under the shoulder section 33 of the barrel 21. A small diameter tail end 60 of the needle sheath 44 originally fitted around the needle holder 23 is then inserted into the needle holder cavity 31 to seal the same. Therefore, the tip 40 of the needle 24 is prevented from unexpectedly protruding out of the needle holder cavity 31. Finally, as shown in Fig. 10, the plunger 22 is pushed forward to press the tip 40 against the shoulder 33 of the barrel 21 so as to bend and destroy the needle 24.

Figs. 11 to 14 show a second embodiment of the present invention, in which the operation procedure is identical to that of the first embodiment. The difference between the two

embodiments only resides in that the positions of the clicks 25 & 25' and the detent 26 are exchanged.

According to the above arrangement, the present invention has the following advantages:

1. The safety syringe can avoid leakage of liquid medicine and prevent the needle from accidentally dropping out of the barrel. Also, the needle can be easily pulled back into the barrel.
2. The plunger can be easily firmly latched with the needle and the needle can be also reliably pulled back into the barrel.
3. Before the injection is completed, the needle is prevented from being latched by mistake.

It is to be understood that the above description and drawings are only used for illustrating some embodiments of the present invention, not intended to limit the scope thereof. Any variation and derivation from the above description and drawings should be included in the scope of the present invention.

CLAIMS

1. A retractable and destructible safety syringe comprising:

a syringe barrel having a first and a second ends and formed with an internal chamber, the first end being disposed with a needle socket defining a needle holder cavity, an annular shoulder section being formed between the internal chamber and the cavity;

a plunger having a first and a second ends, the first end being disposed with a piston and fitted into the barrel, the plunger having a first axis;

a needle holder having a first and a second ends, an outer periphery of the second end being fitted in the internal chamber of the first end of the barrel, the needle holder having a second axis;

a needle inserted into the first end of the needle holder; and

a needle retracting means including:

at least a click having a first and a second ends, the first end being rotatably and resiliently disposed on one of the first end of the plunger and the first end of the needle holder, a distance between the first end of the click and any

of the first and second axes being defined as a first distance, the second end of the click extending toward the other of the first end of the plunger and the first end of the needle holder, in a free state, a distance between the second end of the click and any of the first and second axes being defined as a second distance, the second distance being less than the first distance; and

a detent having a first and a second ends, the first end being disposed on the other of the first end of the plunger and the first end of the needle holder, the first end extending along the axes toward one of the first end of the plunger and the first end of the needle holder, the second end of the detent being disposed with a hook section having a radially extending hook surface, whereby when the first end of the plunger is pushed to the first end of the barrel, the hook section of the detent slides over the second end of the click, then the click resiliently clamp the hook of the detent and when the plunger is pulled from the first end of the barrel to the second end thereof, the hook surface of the hook section abuts against the second end of the click to force the second end toward the center of the detent so as to firmly engage with the hook surface of the hook section and pull the needle holder and the needle back into the barrel.

2. A safety syringe as claimed in claim 1, wherein at least two clicks are radially arranged about the axes.

3. A safety syringe as claimed in claim 1, wherein one of the inner wall of the needle holder cavity and the outer wall of the needle holder further includes a sealing fixing ring.

4. A safety syringe as claimed in claim 3, wherein at least two sealing fixing rings are provided.

5. A safety syringe as claimed in claim 1, wherein both of the inner wall of the needle holder cavity and the outer wall of the needle holder further include sealing fixing rings fitted with each other.

6. A safety syringe as claimed in claim 5, wherein at least two sealing fixing rings are provided.

7. A safety syringe as claimed in claim 1, 2, 3, 4, 5 or 6, further comprising:

an ensurance latch plate having a first and a second ends, the first end being connected with the second end of the barrel;

a first latch section disposed at the second end of the ensurance latch plate; and

a second latch section disposed at the second end of the plunger, the second latch section being latched with the first

latch section so as to locate the detent near the click and prevent the detent from engaging with the click by mistake.

8. A safety syringe constructed and arranged to function as described herein and illustrated with reference to the drawings.



The
Patent
Office

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Application No: GB 9727303.1
Claims searched: 1-8

Examiner: Dr Jason Bellia
Date of search: 18 June 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): A5R (RCQ)

Int Cl (Ed.6): A61M 5/32, 5/50

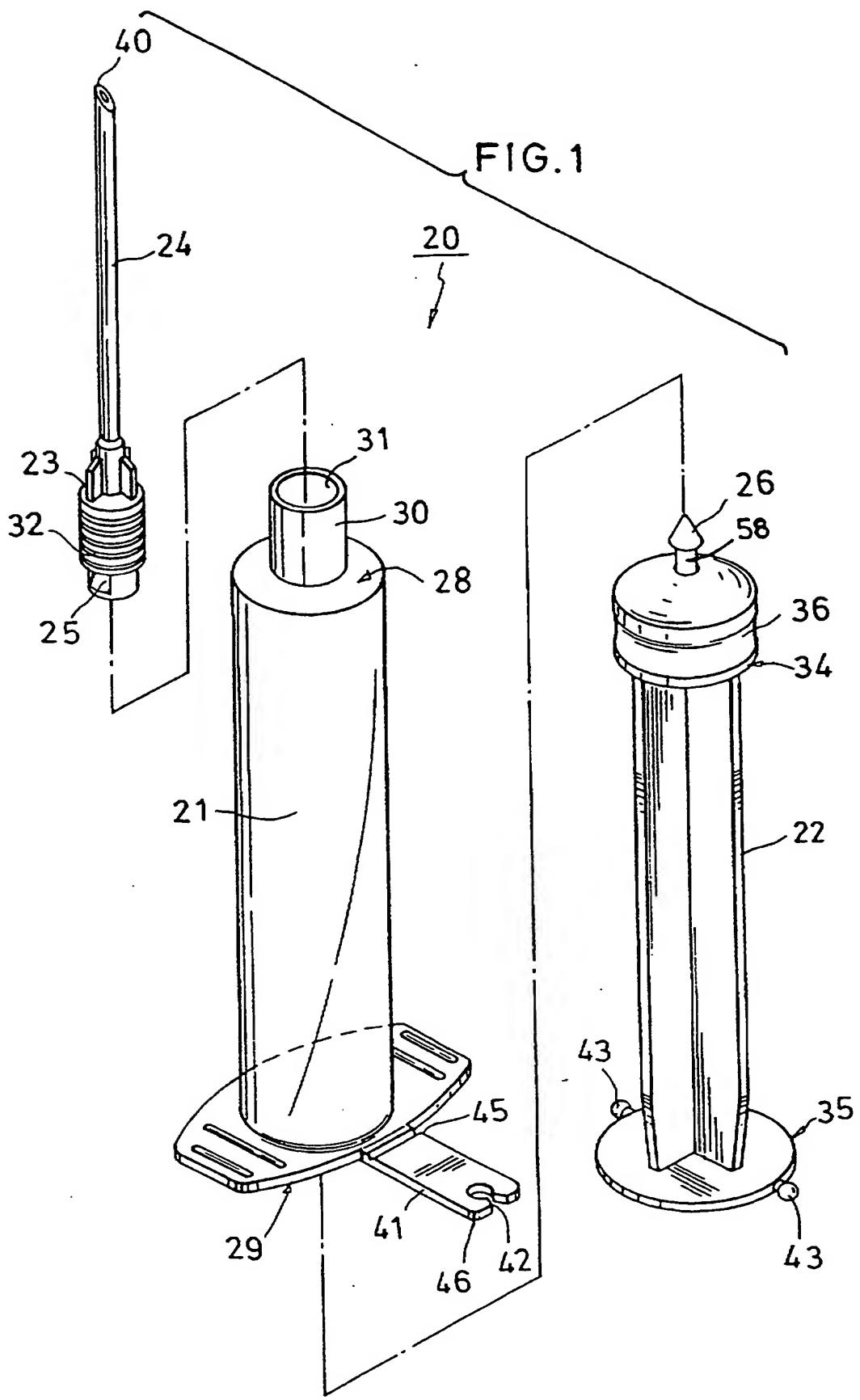
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0321903 A2 (DOLGIN) See Figures 7, 8, 11 & 12 and column 9 line 4-51 & column 11 line 11-51	1, 2
X	WO 94/05356 A1 (BROWN) See Figures 1, 3, 6, 9 & 10	1-4
X	US 5405327 (CHEN) See Figures 1-5	1, 3-5

- X Document indicating lack of novelty or inventive step
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- A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
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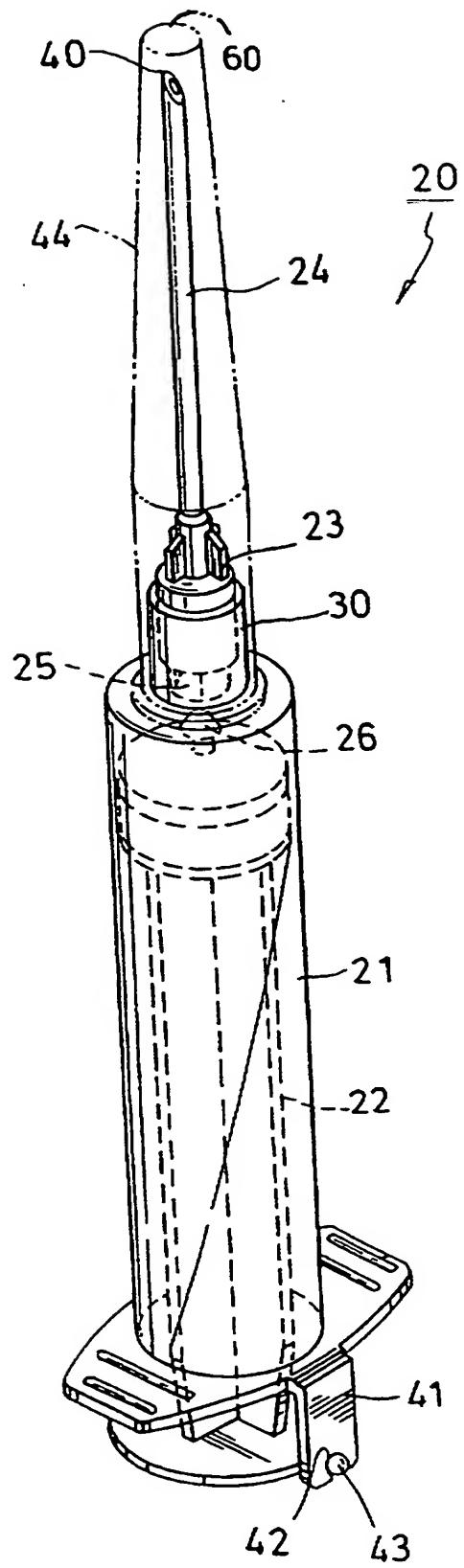


FIG. 2

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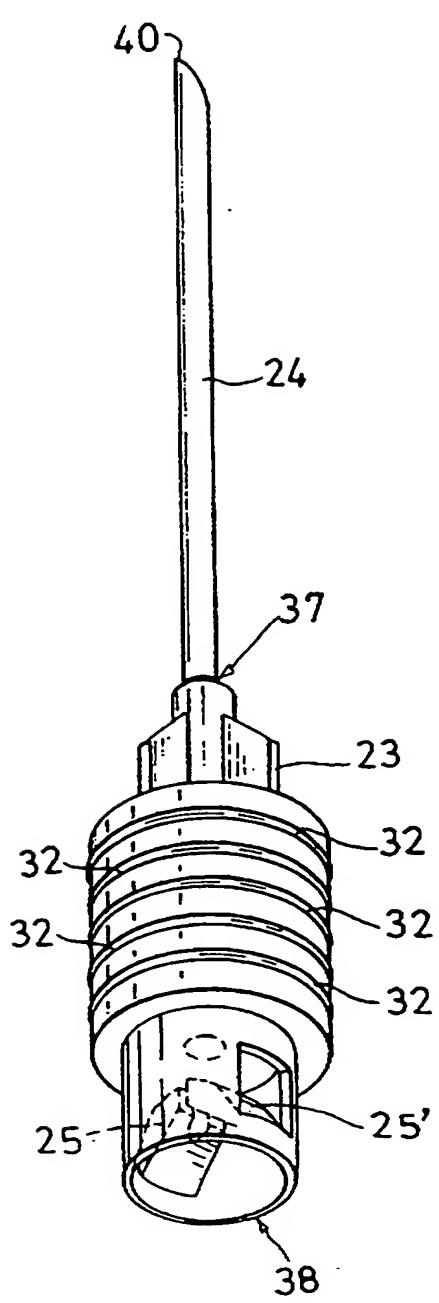


FIG. 3

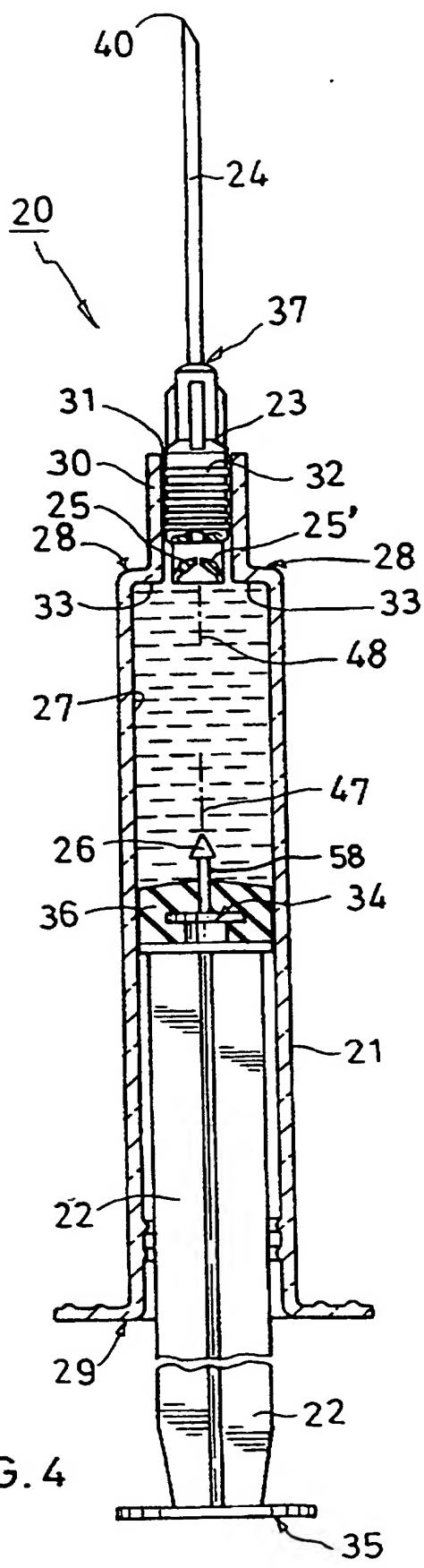


FIG. 4

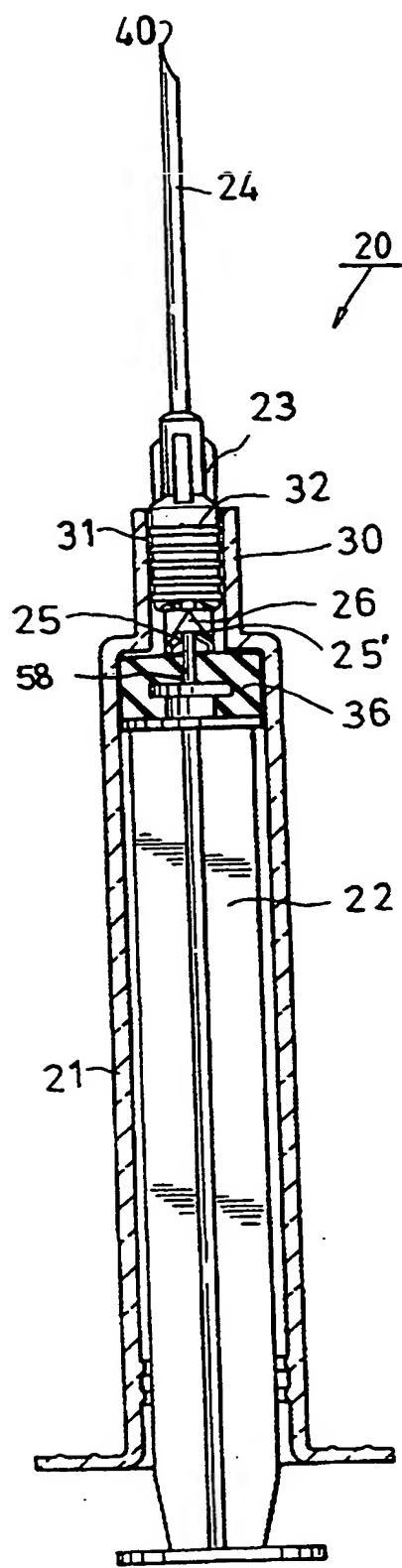


FIG. 5

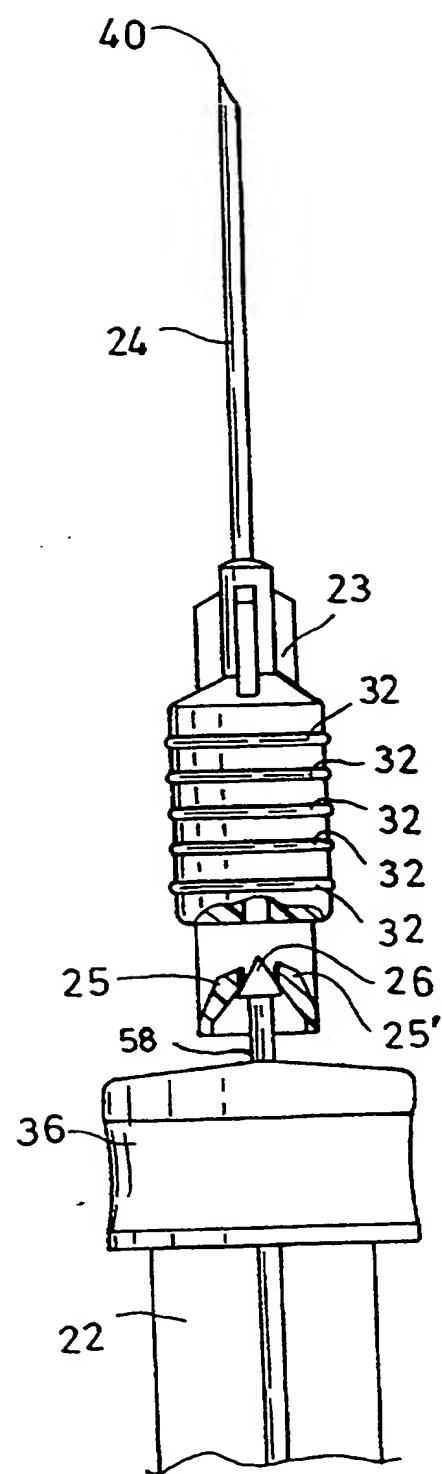


FIG. 6

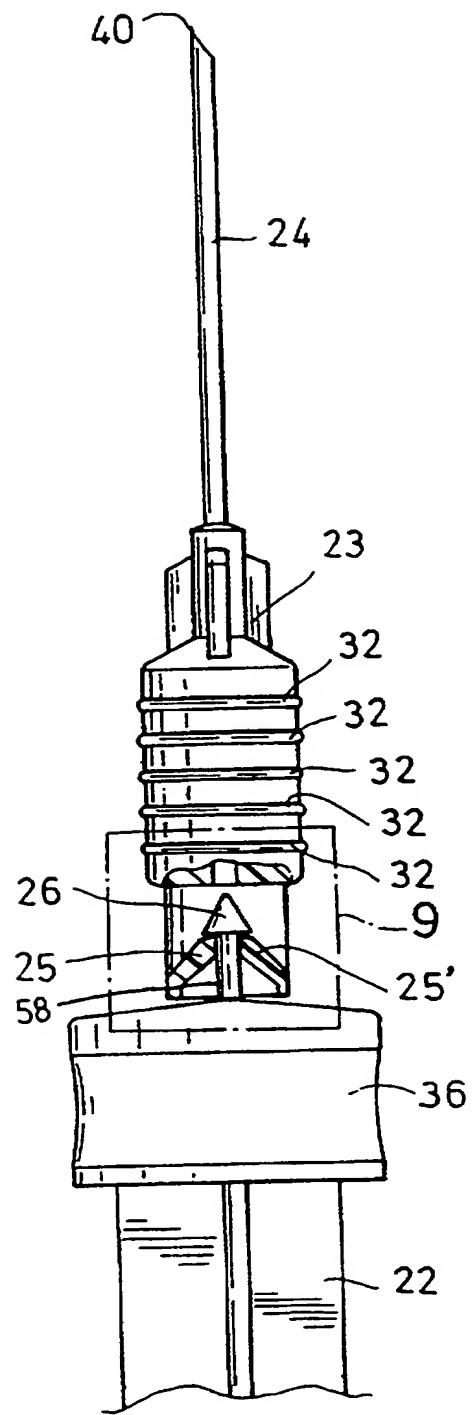


FIG. 7

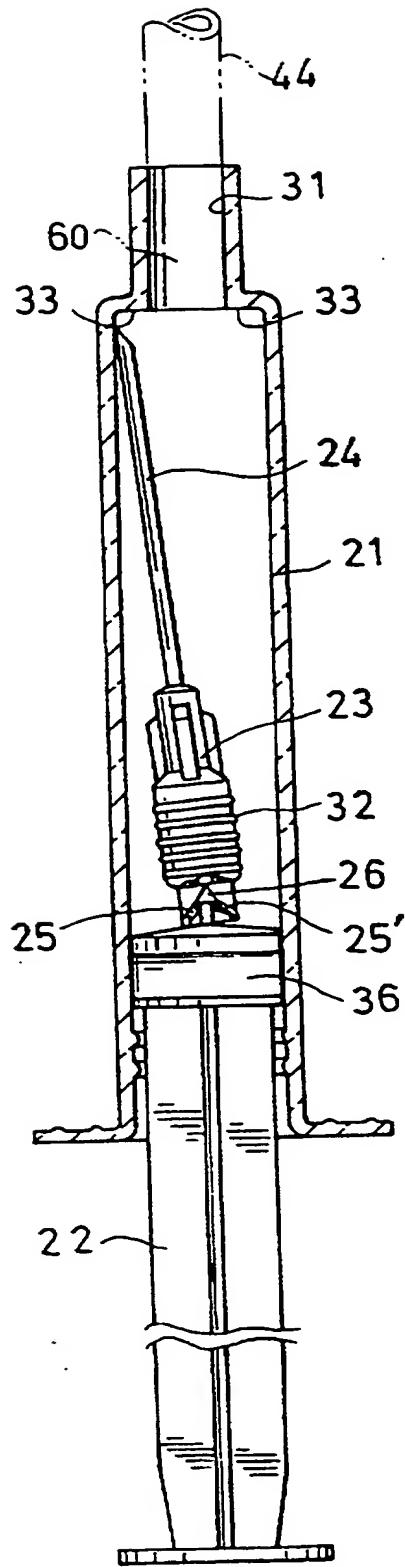


FIG. 8

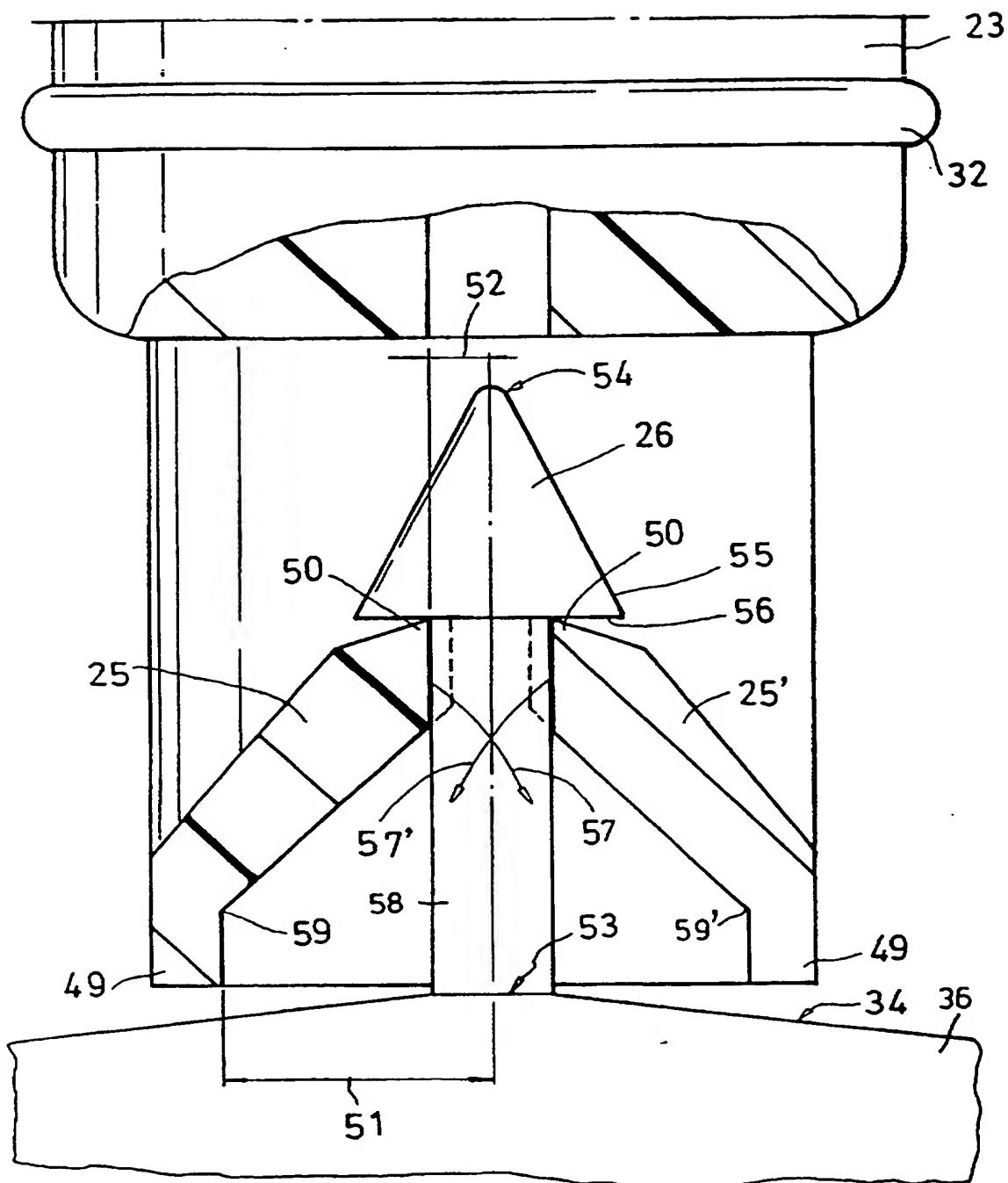


FIG. 9

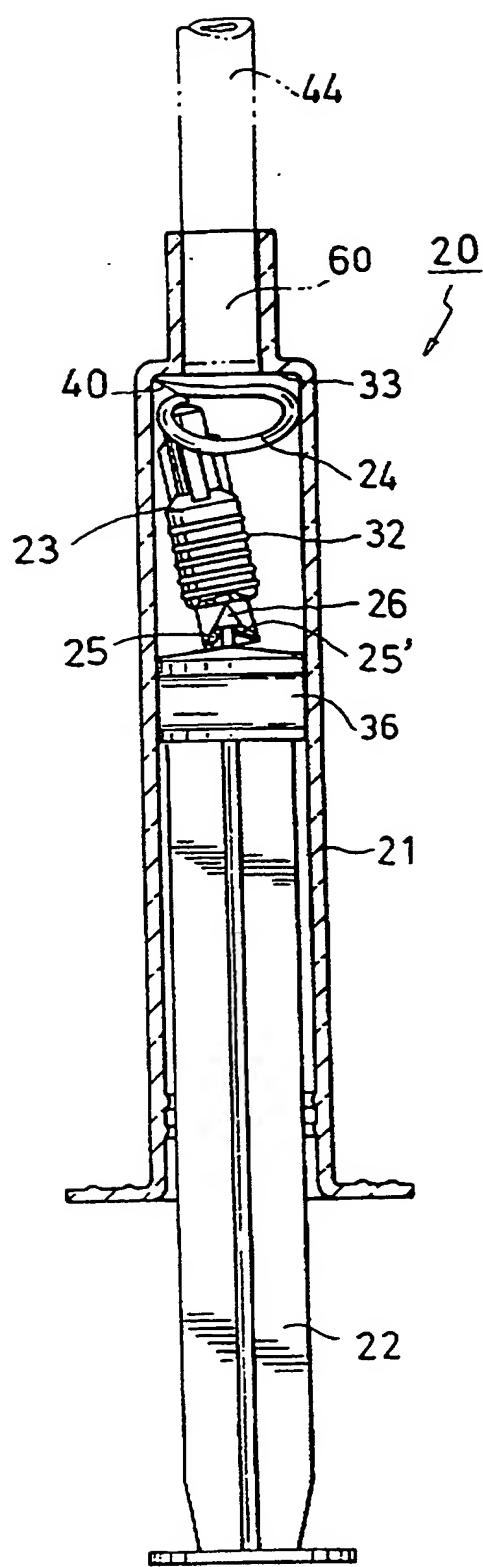


FIG. 10

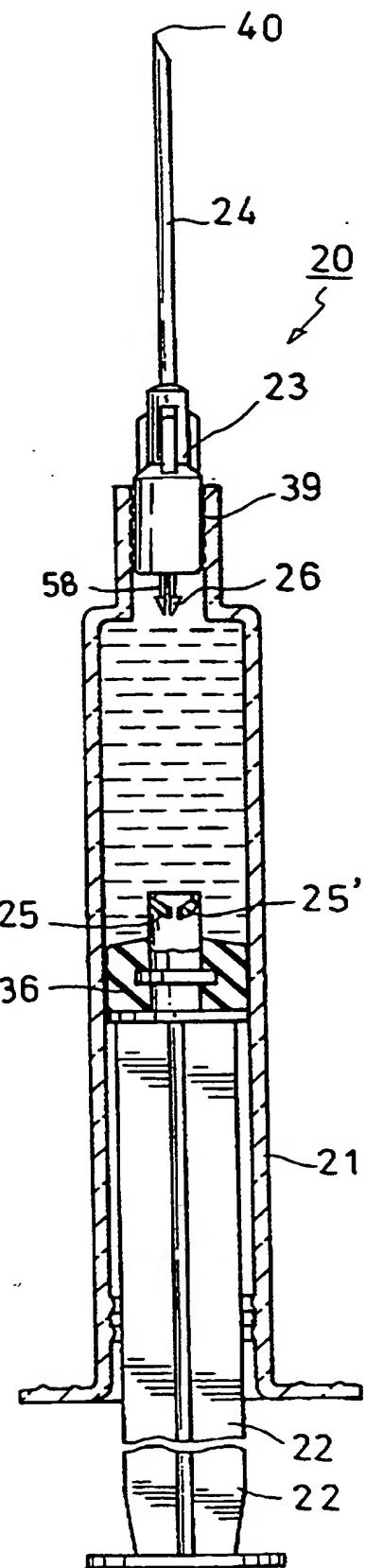


FIG. 11

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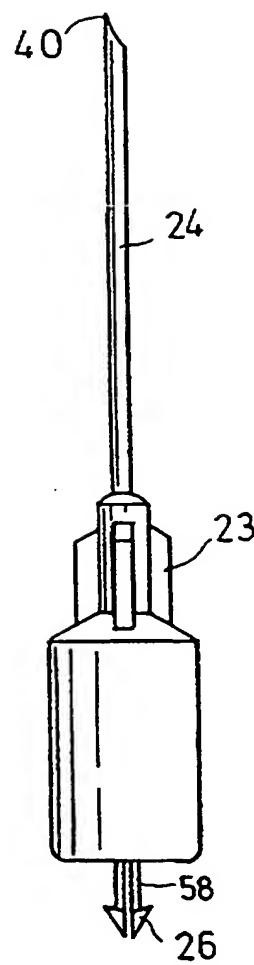


FIG. 12

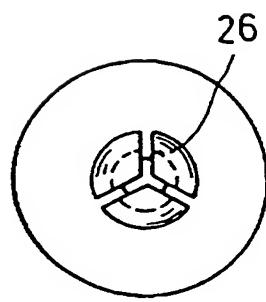


FIG. 13

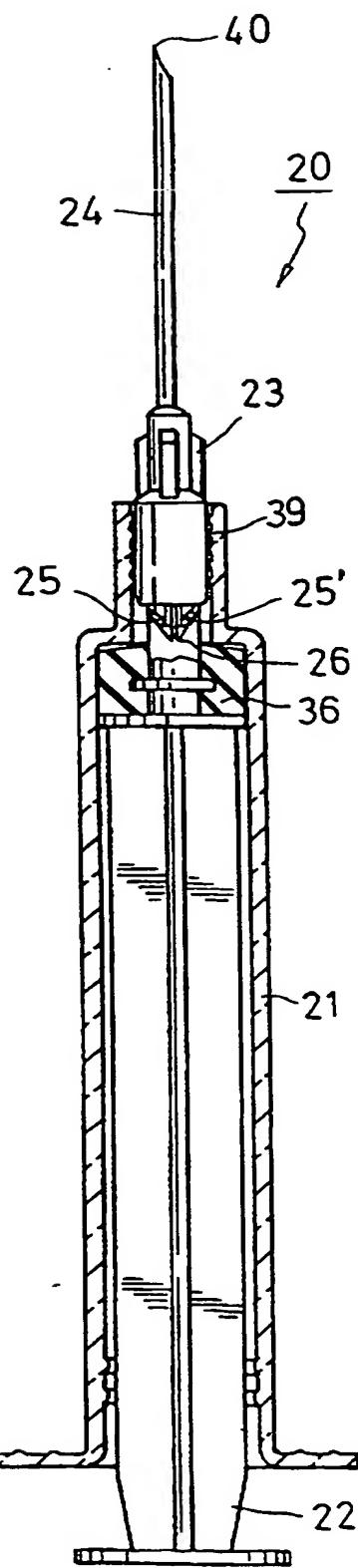


FIG. 14

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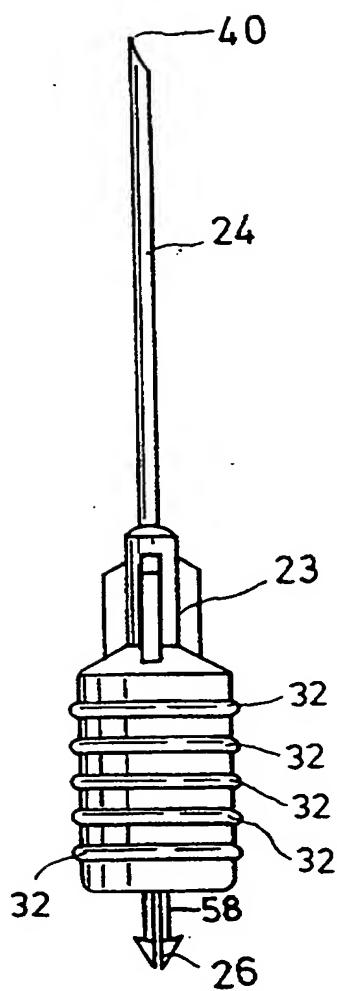


FIG.15

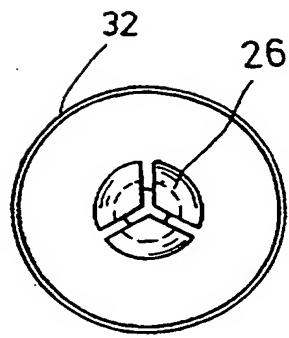


FIG.16

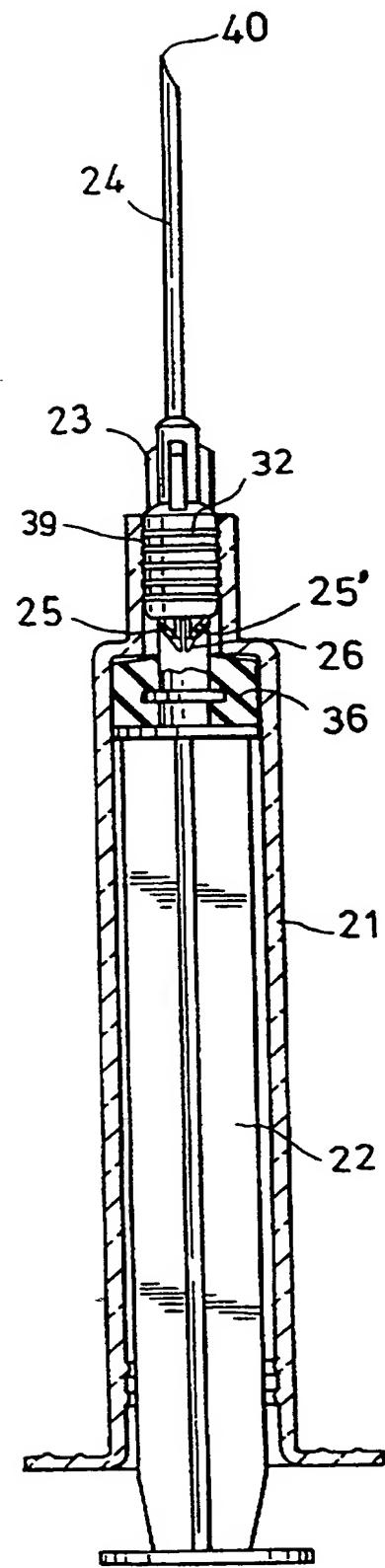


FIG.17